

CLAIMS:

1. A method of treating an outer surface of a food product, the method comprising:

5 placing a food product having an outer surface on an advancement mechanism;

providing a steam sleeve for generating a flow of steam having selected properties to treat the outer surface of the food product, the steam sleeve having an entrance and an exit;

10 passing the food product in a feed direction through the steam sleeve using the advancement mechanism; and

generating the flow of steam in the steam sleeve while the food product is passing therethrough, the flow of steam contacting the outer surface of the food product for  
15 treatment of the outer surface of the food product.

2. A method of treating an outer surface of a food product in accordance with claim 1, wherein the step of generating the flow of steam in the steam sleeve while the food product is passing therethrough includes the step of  
20 circulating the flow of steam in the steam sleeve within a channel formed in an interior of the sleeve having an inlet for introduction of the steam into the sleeve and an outlet for removal of the steam and condensate from the sleeve.

3. A method of treating an outer surface of a food  
25 product in accordance with claim 2, wherein the channel is generally circular and aligned perpendicular relative to a longitudinal axis of the food product, and the step of circulating the flow of steam in the steam sleeve within a channel includes the step of introducing the steam into the

entrance of the channel with a tangential velocity effective to generate a circular flow directing at least some of the steam condensation away from the outer surface of the food product.

5           4.    A method of treating an outer surface of a food product in accordance with claim 3, wherein the step of circulating the flow of steam in the steam sleeve comprises directing the flow of steam through a helical channel.

10           5.    A method of treating an outer surface of a food product in accordance with claim 4 wherein the step of directing the flow of steam through a helical channel includes positioning the inlet and outlet so that the flow of steam from entrance to exit of the sleeve is in a general direction opposite to that of the feed direction of  
15 the food product.

          6.    A method of treating an outer surface of a food product in accordance with claim 4, including the step of providing more than one set of helical channels each having their own inlet for introduction of the steam into the  
20 sleeve and outlet for removal of the steam from the sleeve.

          7.    A method of treating an outer surface of a food product in accordance with claim 6, including the step of positioning the inlet and outlet of one of the helical channels so that the flow of steam is in a general  
25 direction opposite to that of the feed direction of the food product and positioning the inlet and outlet of another of the helical channels so that the flow of steam

is in the same general direction as that of the feed direction of the food product.

8. A method of treating an outer surface of a food product in accordance with claim 1, wherein the step of  
5 passing the food product in a feed direction through the steam sleeve using the advancement mechanism includes the step of forming a substantial seal between the outer surface of the food product and at least one of the entrance and exit of the steam sleeve using a generally  
10 flexible wiper element.

9. A method of treating an outer surface of a food product in accordance with claim 1, wherein the step of passing the food product in a feed direction through the steam sleeve using the advancement mechanism includes the  
15 step of continuously advancing the food product with the advancement mechanism during the step of generating the flow of steam in the steam sleeve.

10. A method of treating an outer surface of a food product in accordance with claim 3, wherein the step of  
20 circulating the flow of steam in the steam sleeve within a channel having an inlet for introduction of the steam into the sleeve and an outlet for removal of the steam and condensate from the sleeve includes the step of forming multiple single-revolution channels each having their own  
25 inlet and outlet.

11. A method of treating an outer surface of a food product in accordance with claim 1, wherein the passing of

the food product in a feed direction through the steam sleeve using the advancement mechanism occurs at a predetermined rate, the method including the step of selecting the predetermined rate and the selected  
5 properties of the fluid to achieve a predetermined temperature of surface and immediate depth of the food product effective to provide for slicability of the food product.

12. A method of treating an outer surface of a food  
10 product in accordance with claim 1, wherein the steps of passing the food product in a feed direction through the steam sleeve using the advancement mechanism generating the flow of steam in the steam sleeve while the food product is passing therethrough occur immediately prior to a slicing  
15 station where an end of the food product is sliced.

13. A method of treating an outer surface of a food product in accordance with claim 12, wherein a sealing gate is positioned adjacent the exit opening of the steam sleeve, the sealing gate being selectively shiftable  
20 between a sealing position substantially closing the exit opening and an unsealing position allowing access to the exit opening.

14. A method of treating an outer surface of a food product in accordance with claim 13, including the  
25 following steps:

positioning the sealing gate in the sealing position when the food product enters the steam sleeve;

maintaining the sealing gate in the sealing position as a leading face of the food product is advanced through

the sleeve during the step of generating the flow of steam in the steam sleeve for treatment of the leading face of the food product; and

shifting the sealing gate from the sealing position to the unsealing position when the leading face of the food product has been advanced proximate thereto to allow the food product to be advanced through the exit opening of the steam sleeve.

10           15. A method of treating an outer surface of a food product in accordance with claim 1 including the step of retracting the advancement mechanism away from a trailing face of the food product while the trailing face of the food product is positioned within the steam sleeve for a  
15 predetermined period of time sufficient to provide steam treatment to the trailing face of the food product prior to advancement of the food product through the exit opening of the steam sleeve with the advancement mechanism.

20           16. A method of treating an outer surface of a food product in accordance with claim 1, wherein the steps of passing the food product in a feed direction through the steam sleeve using the advancement mechanism generating the flow of steam in the steam sleeve while the food product is  
25 passing therethrough occur immediately after a cooling operation where the outer surface of the food product is cooled.

          17. An apparatus for treating the surface of a food  
30 product with fluid, the apparatus comprising:

          a sleeve having an entrance opening and an exit opening, the entrance and exit openings being sized

approximately the same as a cross-sectional profile of the food product;

a plurality of channels formed in an interior of the sleeve between the entrance opening and the exit opening,  
5 the channels capable of directing the flow of fluid at least partially around an outer portion of the food product, and at least one of the channels having a fluid inlet and at least one of the channels having a fluid outlet to permit the introduction and removal of the fluid  
10 into the sleeve.

18. An apparatus in accordance with claim 17, wherein at least some of the plurality of channels are connected in a generally helical arrangement providing a continuous  
15 fluid flow path from the fluid inlet to the fluid outlet.

19. An apparatus in accordance with claim 18, wherein at least two generally helical arrangements of the plurality of channels are provided forming two separate continuous fluid flow paths from fluid inlets to fluid  
20 outlets.

20. An apparatus in accordance with claim 17, wherein a seal element is provided proximate at least one of the sleeve entrance and exit openings, the seal element having an opening substantially the same size as the cross-  
25 sectional profile of the food product and smaller than the opening of the at least one of the sleeve entrance and exit openings.

21. An apparatus in accordance with claim 20, wherein the entrance opening and exit opening have a shape generally the same as the seal element opening shape.

22. An apparatus in accordance with claim 20, wherein  
5 the entrance opening, exit opening, and seal element openings are all either circular, D-shaped, rectangular, oval or square.

23. An apparatus in accordance with claim 17, wherein  
10 the sleeve is formed of a plurality of plates arranged in an adjacent manner, the plates each having an opening therethrough and one of the plurality of channels formed adjacent the opening in an interior of the plate, the channels each having an inlet and an outlet and generally surrounding the plate opening.

15 24. An apparatus in accordance with claim 23, wherein the channel inlets and outlets of adjacent plates are staggered to define flow paths in adjacent plates having alternating directions.

25. An apparatus in accordance with claim 23, wherein  
20 seal elements are positioned between adjacent plates and at least partially define the channels.

26. An apparatus for treating an outer surface of a food product, the apparatus comprising:

means for generating a flow of steam in an interior of  
25 a steam sleeve having an entrance and an exit, the steam having selected properties to treat the outer surface of the food product; and

means for advancing a food product having an outer surface in a feed direction through the interior of the steam sleeve between the entrance and exit thereof, the flow of steam in the steam sleeve contacting the outer  
5 surface of the food product while the food product is passing therethrough at the predetermined temperature for treating the outer surface of the food product.

27. An apparatus for treating an outer surface of a food product in accordance with claim 26, including means  
10 for directing steam condensation away from the outer surface of the food product.